**South Dakota Agricultural Education (AFNR)**

**Academic Integration Activities**

**ACTIVITY #8**

*Fundamental Ag Mechanics students will be able to use proportions to solve agricultural mechanic problems.*

**1. Ag Standard**

Fundamental Ag Mechanics 3.1: Create sketches of agricultural equipment.

* Utilize drawing techniques to develop a simple sketch.
* Use scale measurement and dimension to develop simple plans and sketches.

**2. Academic Standard**

9-12.G.2.3: Students are able to use proportions to solve problems (Application).

**3. Background Information**

Proportions use ratios to help find the equality between two numbers. A proportion can be written as a/b = c/d. Proportions are used typically to solve for an unknown, c or d.

**4. Example In Context**

Assume a hay wagon has a floor plan with a length of 20 feet and a width of 10 feet. This wagon is sketched onto a piece of paper and when you measure the length with a ruler it is 5 inches. What would be the width of the wagon at that scale?

Identify what we know. A 20 foot line is sketched to 5 inches on paper.

We want to find how many inches a 10 foot line would be on that sketch to keep it to scale.

The value we want to find is represented by an x. We can set up a ratio in our a/b = c/d. It would look like this 20 feet/5 inches = 10 feet/x inches.

Cross multiply. 20 feet = 10 feet

5 inches x inches

To get: 20x = 50

Following algebraic rules, get x alone. To do that, divide both sides by 20. 20x = 50

20 20

This gives us: x = 2.5 inches

The width of the wagon would be 2.5 inches on the sketch to keep it to scale with the length drawn at 5 inches. (Note: this is a ¼ inch = 1 foot scale)

**5. Guided Practice Exercises**

Assume a wood feed bunk is 8 feet long by 2 ½ feet wide. What would be the length and width on a ½ inch = 1 foot scale?

Identify what we know. The scale we want to go to is ½ inch is equal to one foot. We know the bunk is 8 feet long and 2 ½ feet wide.

We want to find out how long an 8 foot and a 2 ½ foot line would be on a ½ inch = 1 foot scale.

This is a two part problem because we need to figure how long two different lines would be, the 8 foot and the 2 ½ foot lines.

|  |  |  |
| --- | --- | --- |
|  | For the 8 foot line | For the 2 ½ foot line |
| Set up the ratio: a/b = c/d | 1 foot/ ½ inch = 8 feet/x inches | 1 foot/½ inch = 2 ½ foot/x inches |
| Cross Multiply | 1 foot = 8 feet  ½ inch x inches | 1 foot = 2 ½ foot  ½ inch x inches |
| To get | 1x = 4 | 1x = 1.25 |
| Get x alone | 1 x = 4  1 1 | 1 x = 1.25  1 1 |
| x = | x = 4 inches | X = 1.25 inches |
| *Answer* | *An 8 foot length is 4 inches* | *A 2 ½ foot width is 1.25 inches* |

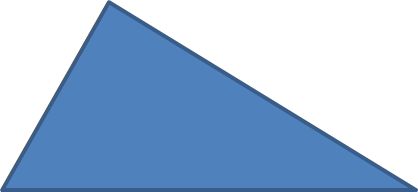
**6. Independent Practice Exercises**

Assume you are given a toy farm tractor at a 1/8 inch equals 1 foot scale. When you measure the toy tractor it is 2 inches from where the wheels touch the desk to the top of the cab. How tall would the actual tractor be if it is exactly proportional to the 1/8 inch scale?

*Answer: 16 feet (1/8 inch = 2 inch , 1/8x = 2, divide both sides by 1/8, x = 16)*

1 foot x feet

Assume the sketches of the two metal brackets below are proportional to each other. What is the value of x?

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9 12 3 4

x

15

*Answer: 5 (multiple options of how to solve, one is 9/3 = 15/x)*

**7. Notes**

The Fundamental Ag Mechanics teacher could have students use a drafting scale to further enhance understanding of proportions.